

What is claimed:

1. An isolated nucleic acid molecule comprising the nucleotide sequence selected from the group consisting of the nucleotide sequence set forth in SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:7, and SEQ ID NO:8.
2. An isolated nucleic acid molecule which encodes a polypeptide comprising the amino acid sequence selected from the group consisting of the amino acid sequence set forth in SEQ ID NO:3, SEQ ID NO:6, and SEQ ID NO:9.
3. An isolated nucleic acid molecule comprising the nucleic acid molecule of claim 1 and a nucleotide sequence encoding a heterologous polypeptide.
4. A vector comprising the nucleic acid molecule of claim 1.
5. A host cell transfected with the vector of claim 4.
6. A method of producing a polypeptide comprising culturing the host cell of claim 5 in an appropriate culture medium to, thereby, produce the polypeptide.
7. An isolated FRD3 polypeptide comprising the amino acid sequence selected from the group consisting of the amino acid sequence set forth in SEQ ID NO:3, 6, and 9.
8. The isolated FRD3 polypeptide of claim 7 produced by recombinant or synthetic means.
9. The polypeptide of claim 7, further comprising heterologous amino acid sequences.
10. An antibody which selectively binds to a polypeptide of claim 7.
11. A transgenic plant comprising an isolated FRD3 polypeptide, or a portion thereof, having FRD3-mediated activity.

12. The transgenic plant of claim 11, wherein the FRD3 polypeptide comprises the amino acid sequence selected from the group consisting of the amino acid sequence set forth in SEQ ID NO:3, 6, 9, and 10, or a polymorphic variant thereof.

5

13. A transgenic plant comprising a FRD3 polypeptide encoded by the nucleic acid comprising the nucleotide sequence selected from the group consisting of the nucleotide sequence set forth in SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:8, and SEQ ID NO:20, or an allelic variant thereof.

10

14. The transgenic plant of claim 11, wherein the plant is selected from the group consisting of maize, wheat, rye, sorghum, cassava, beans, rice, beans, and peas.

15

15. A composition comprising the transgenic plant of claim 11 or a portion thereof, and a pharmaceutical acceptable carrier.

16. A method for modulating metal concentration in a biological sample containing the metal, comprising:

20

- (a) providing the transgenic plant of claim 11; and
- (b) contacting the transgenic plant with the biological sample, such that the metal concentration in the biological sample is modulated.

17. A method for removing a pollutant from soil, comprising contacting the transgenic plant of claim 11 with the soil such that the pollutant is removed from the soil.

25

18. The method of claim 17, wherein the pollutant is a metal.

30

19. The method of claim 18, wherein the metal is selected from the group consisting of As, Pb, Co, Cd, Hg, Zn, and Cu.

20. A method for treating a disorder associated with metal-deficiency in a subject comprising administering to the subject a therapeutically effective amount of a composition comprising the transgenic plant of claim 11, or a portion thereof.

35

21. The method of claim 20, wherein the FRD3 polypeptide in the transgenic plant is overexpressed.
- 5 22. The method of claim 20, wherein the disorder is associated with iron deficiency.
23. The method of claim 22, wherein the disorder is anemia.
- 10 24. The method of claim 20, wherein the disorder is associated with zinc deficiency.
- 15 25. A method for promoting plant growth, comprising introducing into a plant the isolated nucleic acid molecule comprising the nucleotide sequence selected from the group consisting of the nucleotide sequence set forth in SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:8, and SEQ ID NO:20, or an allelic variant thereof.
- 20 26. A method for promoting plant growth, comprising introducing into a plant an isolated FRD3 polypeptide having FRD3-mediated activity.